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Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

On May 14, 2004

TOWNSEND and TOWNSEND and CREW LLP

By: [Signature]

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of:

Yusuke Hirakawa

Application No.: 10/650,338

Filed: August 27, 2003

For: STORAGE SYSTEMS

Customer No.: 20350

Confirmation Number.: 6839

Examiner: Unassigned

Technology Center/Art Unit: 2171

PETITION TO MAKE SPECIAL FOR  
NEW APPLICATION UNDER M.P.E.P. §  
708.02, VIII

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

This is a petition to make special the above-identified application under MPEP § 708.02, VIII. The application has not received any examination by the Examiner.

(a) The Commissioner is authorized to charge the petition fee of \$130 under 37 C.F.R. § 1.17(i) and any other fees associated with this paper to Deposit Account 20-1430.

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(b) All the claims are believed to be directed to a single invention. If the Office determines that all the claims presented are not obviously directed to a single invention, then Applicant will make an election without traverse as a prerequisite to the grant of special status. If claims 17-28 are found not to be examinable with the group including claims 1-16, then Applicant hereby cancels claims 17-28 and elects claims 1-16 and any other claims in the same group. If claims 29-39 are found not to be examinable with the group including claims 1-16, then Applicant hereby cancels claim 29-39 and elects claims 1-16 and any other claims in the same group. If claims 40-42 are found not to be examinable with the group including claims 1-16, then Applicant hereby cancels claim 40-42 and elects claims 1-16 and any other claims in the same group.

(c) Pre-examination searches were made covering Subclasses 6, 11, 13, and 19 of Class 714; Subclasses 113, 114, 162, and 164 of Class 711; Subclass 21 of Class 710; and Subclasses 8, 10, and 201-206 of Class 707, by Mattingly, Stanger & Malur, P.C. ("Mattingly"), a professional search firm. The U.S. Patent and U.S. Patent Publication databases were searched. Copies of the letter and search report received from Mattingly are enclosed.

(d) The following U.S. patents and applications, accordingly to Mattingly, have been deemed most closely related to the subject matter encompassed by the claims:

- (1) U.S. Patent No. 5,974,563 to Beeler
- (2) U.S. Patent No. 6,178,427 to Parker
- (3) U.S. Patent No. 6,282,610 to Bergsten
- (4) U.S. Patent No. 6,308,283 to Galipeau
- (5) U.S. Patent No. 6,393,538 to Murayama
- (6) U.S. Patent No. 6,397,307 to Ohran
- (7) U.S. Patent No. 6,408,370 to Yamamoto
- (8) U.S. Patent No. 6,442,706 to Wahl
- (9) U.S. Patent No. 6,560,055 to Midgley
- (10) U.S. Patent No. 6,487,645 to Clark
- (11) U.S. Patent No. 6,526,487 to Ohran
- (12) U.S. Patent App. Pub. No. 2003/0074378 to Midgley

- (13) U.S. Patent App. Pub. No. 2003/0014433 to Teloh
- (13) U.S. Patent App. Pub. No. 2003/0014432 to Teloh
- (13) U.S. Patent App. Pub. No. 2002/133511 to Hostetter
- (13) U.S. Patent App. Pub. No. 2003/0074600 to Tamatsu

(e) Set forth below is a detailed discussion of references which points out with particularity how the claimed subject matter is distinguishable over the references.

Claimed Embodiments of the Present Invention.

The claimed embodiments relates to a storage system group configured to provide data replication. The storage system group includes a first storage system that includes at least two storage areas or volumes, i.e., first and second storage areas. The data received from a host is stored in the first storage area. The data and update information associated with the data are stored in the second storage area. In one embodiment, the update information and the data are stored in separate regions of the second storage area (see Fig. 8).

The data and update information stored in the second area are transmitted to the second storage system. The second storage system stores these in a third storage area or volume. That is, the third storage area is configured to store both the data and update information. The second storage system then performs a restore process to obtain the data from the third storage area and store only the data in a fourth storage area or volume.

The embodiments above use two storage areas in the first storage system to quickly write data received from a host to one storage area and use the second area for data replication purposes (see claim 1). Other advantages of the embodiments above are explained below.

Claim 1 recites, "a first storage system coupled to a host device for sending data to and configured to receive data from said host device, the first storage system including a plurality of disk drives and a disk adaptor used to control the disk drives; and a second storage system coupled to said first storage system for receiving data from said first storage system, wherein said first storage system comprises: a first storage area for writing the data received

from said host device, the first storage are being defined on at least one of the disk drives; and a second storage area for writing the data written in said first storage area and update information relating to said data, the second storage are being defined on at least one of the disk drives; said second storage system comprises a third storage area for storing the data read from said second storage area and the update information relating to said data, where the data and update information to be stored in said third storage area are read from said first storage system at given time intervals."

One of the features of claim 2 relates to having the second storage system provide data mirroring of the first storage area at the fourth storage area using the data and update information stored in the third storage area. Another feature of claim 2 is to have two different storage regions, one for storing data and another for storing update information.

One of the features of claim 8 relates to having the second storage system obtain management information from the first storage to enable the second storage system to define the timing of the data and update information transmission.

Claims 17 and 29, each recites a storage system group having at least three storage systems to implement the data replication.

Claim 40 is directed to a storage system provided in a storage system group for data replication. The storage system includes a first storage area to store data and a second storage area to store a journal corresponding to the data. The storage system transmits the journal including both journal data and update information to a remote storage system for data mirroring.

U.S. Patent No. 5,974,563 to Beeler

Beeler discloses a computer network system, where a user-defined file modification request is communicated to a primary server, which then communicates the request to a secondary server. The file modification request is saved in a non-volatile storage media associated with the primary server, and the file modification request is executed and saved in a non-volatile storage media associated with the secondary server.

Beeler does not disclose "a first storage system" including a plurality of disk drives and a disk adaptor. Nor does it disclose "a first storage area" for storing data received from a host and "a second storage area" for storing the data and update information, where both the first and second storage areas are in the same storage system.

U.S. Patent No. 6,178,427 to Parker

Parker discloses a method of mirroring log data in real time. The method can be used to mirror all log data from a source database or only that log data pertaining to a subset of objects in the source database. The log data is written to one or more datasets which are created and stored in a target database system which is typically remotely located. The log datasets in the target system can be used for disaster recovery of the source system. The method monitors log data from the source system and automatically updates target log datasets accordingly.

This reference does not appear to disclose "a first storage system" including a plurality of disk drives and a disk adaptor. Nor does it disclose "a first storage area" for storing data received from a host and "a second storage area" for storing the data and update information. A third storage area in a second storage system for storing the data and update information is also not disclosed.

U.S. Patent No. 6,282,610 to Bergsten

Bergsten discloses a network comprising at least one host processing system, a number of storage controllers, each coupled to one of a plurality of storage arrays. Each storage array includes at least one mass storage device. Multiple copies of data are maintained in storage arrays that are geographically remote to each other, such that any copy can be accessed by any host. Each storage controller includes an interface with a host that emulates a mass storage device and an interface with a local storage array that emulates a host (see Fig. 1).

This reference does not appear to disclose "a first storage system" including "a first storage area" for storing data received from a host and "a second storage area" for storing the data and update information. Nor does it disclose a third storage area in a second storage system for storing the data and update information received from the second storage area.

U.S. Patent No. 6,308,283 to Galipeau

Galipeau discloses a system and method for providing substantially concurrent mirroring of files across a network. A data file is selected for mirroring on a local computer system. One or more remote computer systems are designated to store a back-up copy of the selected data file. As changes to the selected data file occur, change information is captured by a mirroring driver, which is attached to the file system driver, and then forwarded from the local computer system across the network to the remote computer system or systems. Each remote computer system then updates the back-up copy of the data file.

Galipeau does not appear to disclose a first storage system with a disk adaptor to control a plurality of disk drives. The local and remote computer systems appear to be servers with storage areas, not a storage system as recited in claim 1. In addition, this reference does not disclose "a first storage area" for storing data received from a host and "a second storage area" for storing the data and update information. A third storage area in a second storage system for storing the data and update information received from the second storage area is also not disclosed.

U.S. Patent No. 6,393,538 to Murayama

Murayama discloses a data duplicating system. In order to duplicate data, a primary file unit issues a command to a secondary file unit when the former receives a write command from a host apparatus. The primary file unit writes the data to its storage and transmits the data to the secondary file unit.

This reference does not disclose a first storage system having "a first storage area" for storing write data received from a host and "a second storage area" for storing the write data and update information associated with the write data. Accordingly, Murayama does not disclose a third storage area in a second storage system that stores the write data and update information received from the second storage area.

U.S. Patent No. 6,397,307 to Ohran

Ohran discloses a method and system for mirroring and archiving mass storage. A primary mass storage and a secondary mass storage are synchronized to contain the same data. Thereafter, a primary system tracks changes made to the primary mass storage. These changes are consolidated periodically into update files. These update files contain only those changes necessary to represent the modified state of the primary mass storage at the time of the update. The primary system then transfers the update files to a secondary system to bring the secondary mass storage current with the primary mass storage.

Ohran does not appear to disclose a first storage system with a disk adaptor to control a plurality of disk drives. The primary and secondary mass storages appear to be servers with storage areas, not a storage system as recited in claim 1. In addition, this reference does not disclose "a first storage area" for storing data received from a host and "a second storage area" for storing the data and update information. Accordingly, a third storage area in a second storage system for storing the data and update information received from the second storage area is also not disclosed.

U.S. Patent No. 6,408,370 to Yamamoto

Yamamoto discloses a storage system for assuring data integrity in a synchronous remote data copy. A primary controller in the primary storage system operates to transmit write data and a write time to a secondary controller in the earlier sequence of the write times after reporting a completion of a request for write to a processing unit. The secondary controller in the remote storage system stores the write data and the write time transmitted from the primary controller in the cache memory. The secondary controller stores the write data in a disk unit in the earlier sequence of the write time to guarantee the data integrity.

Yamamoto does not disclose "a first storage area" for storing data received from a host and "a second storage area" for storing the data and update information. Accordingly, a third storage area in a second storage system for storing the data and update information received from the second storage area is also not disclosed.

U.S. Patent No. 6,442,706 to Wahl

Wahl discloses a computer network remote data mirroring system that writes update data both to a local data device and to a local, writelog device. A primary mirror daemon on a local computer system monitors the writelog device for data updates and feeds the data over a network in the same order in which it is stored to a remote mirror daemon on a remote computer system, which in turn performs the data updates to a mirror device.

Wahl does not disclose a third storage area of a second storage system for storing the write data and update information received from the first storage system. The local computer system appears to transmit only data to the remote daemon (col. 10:29-42). Note the secondary system 14 only has a mirror device 32 (Fig. 1). Accordingly, Wahl also does not disclose the restore feature recited in claim 2, e.g., the fourth storage area. Wahl also does not disclose the feature of having the second storage system define the timing of the data and update information transmission, as recited in claim 8.

U.S. Patent No. 6,560,055 to Midgeley

Midgley discloses a system for backing up data files. The system includes a back-up server 12 having a target data file and a plurality of data servers 18, 20, and 22 (Fig. 1). Each data server has a source file that is associated with the target file and a storage device 32, 34, or 38. A journal file is transmitted from the data server to the back-up server to provide data mirroring at the back-up server. The back-up server stores the data to a long-term storage system 14.

Midgley does not disclose a first storage system including a plurality of disk drives and a disk adaptor to control the disk drives. That is, the data servers are not the storage system as recited in claim 1. The long term storage system 14 coupled to the back-up server appears to be the only storage system disclosed in Midgley although it is not clear whether or not it has the disk drives and disk adaptor, as recited in the claim. If it does have such components, the long term storage system would, at best, correspond to the first storage system of claim 1. Accordingly, Midgley does not disclose a second storage area in the first storage system, wherein the write data and update information are stored. Nor does it disclose a third storage area



provided in a second storage system that stores the data and update information received from the first storage system.

U.S. Patent No. 6,487,645 to Clark

Clark discloses a data storage subsystem with fairness-driven update blocking. When a primary data storage subsystem receives updates for local storage and mirroring at a counterpart secondary storage subsystem, the primary subsystem institutes device-specific, fairness-driven update blocking to avoid overrunning the primary subsystem's update buffer with updates destined for any one device. That is, the primary subsystem first receives update requests, then logs the updates in an update buffer, then stores the logged updates in primary storage, and finally copies the updates to the secondary storage subsystem. Each update request includes update data and also identifies a targeted logical device, physical device, or other subpart of primary storage. The primary subsystem maintains a counter or other update activity indicator that represents update activity for each storage subpart, such as the number of updates stored in the buffer. For each update request, the primary subsystem determines whether target subpart's update activity exceeds a prescribed level. If not, the update data is stored in primary storage. Otherwise, if the update activity is excessive, the primary subsystem rejects the update. Optionally, the primary subsystem may selectively override certain rejections to prevent completely blocking updates for that subpart.

This reference does not disclose a first storage system having "a first storage area" for storing write data received from a host and "a second storage area" for storing the write data and update information associated with the write data. Accordingly, Clark does not disclose a third storage area in a second storage system that stores the write data and update information received from the second storage area.

U.S. Patent No. 6,526,487 to Ohran

Ohran discloses a primary computer system and a backup computer system to copy data of the primary system to the backup system. Ohran discloses a method of obtaining mirrored data so that the original data can be recovered after failure without transmitting the

entire mirrored data between the computers. A write request at a primary computer is stored in a delay buffer and a copy is transmitted to a backup computer, where it is stored in a delta queue. The backup computer executes the copy of the write request to the mirrored data and transmits an acknowledgement to the primary computer that the copy of the write request has been received. In response to the acknowledgement, the primary computer executes the write request stored in the delay buffer. The computers send to each other subsequent acknowledgements of the write request execution, enabling the computers to delete the write requests. If the primary computer fails, the primary computer can recover the original data by receiving only the copies of write requests that remain stored in the delta queue.

This reference does not disclose a first storage system having "a first storage area" for storing write data received from a host and "a second storage area" for storing the write data and update information associated with the write data. Accordingly, Clark does not disclose a third storage area in a second storage system that stores the write data and update information received from the second storage area.

U.S. Patent App. Pub. No. 2003/0074378 to Midgley

Midgley discloses systems and methods for continuous back up of data stored on a computer network. This reference describes a synchronization process that replicates selected source data files data stored on the network and to create a corresponding set of replicated data files, called the target data files, that are stored on a back up server. This synchronization process builds a baseline data structure of target data files. In parallel to this synchronization process, the system includes a dynamic replication process that includes a plurality of agents, each of which monitors a portion of the source data files to detect and capture, at the byte-level, changes to the source data files. Each agent may record the changes to a respective journal file, and as the dynamic replication process detects that the journal files contain data, the journal files are transferred or copied to the back up server so that the captured changes can be written to the appropriate ones of the target data files.

As with Midgley above (i.e., the '055 patent), this reference does not disclose a first storage system including a plurality of disk drives and a disk adaptor to control the disk

drives. That is, the data servers are not the storage system as recited in claim 1. The long term storage system 14 coupled to the back-up server appears to be the only storage system disclosed in the reference although it is not clear whether the long term storage system has the disk drives and disk adaptor, as recited in the claim. If so, the long term storage system would, at best, correspond to the first storage system of claim 1. Accordingly, this reference does not disclose a second storage area in the first storage system, wherein the write data and update information are stored. Nor does it disclose a third storage area provided in a second storage system that stores the data and update information received from the first storage system.

U.S. Patent App. Pub. No. 2003/0014433 to Teloh

Teloh discloses a method and apparatus for performing remote data replication between servers or hosts having storage devices. The method and apparatus can detect an interruption in the remote data replication process and begin local logging of all local data writes that occur while the remote data replication process is unavailable. The method and apparatus can perform remote data replication across multiple remote storage devices or the method and apparatus can replicate a data structure from a first storage device to multiple locations on one or more remote storage devices.

Teloh does not disclose data duplication between storage systems, as recited in claim 1. More specifically, it does not disclose a first storage system having "a first storage area" for storing write data received from a host and "a second storage area" for storing the write data and update information associated with the write data. Teloh also does not disclose a third storage area in a second storage system that stores the write data and update information received from the second storage area.

U.S. Patent App. Pub. No. 2003/0014432 to Teloh

This reference discloses a method and apparatus for performing remote data replication between servers or hosts. This reference claims priority to the same patent application and appears to have the same specification as Teloh above. As explained above, this method and apparatus does not disclose data duplication between storage systems, as recited in

claim 1. More specifically, it does not disclose a first storage system having "a first storage area" for storing write data received from a host and "a second storage area" for storing the write data and update information associated with the write data. This reference also does not disclose a third storage area in a second storage system that stores the write data and update information received from the second storage area.

U.S. Patent App. Pub. No. 2002/0133511 to Hostetter

Hostetter discloses a system and method for synchronizing a data copy that include a source volume having a data file stored thereon. The source volume is configured to receive write commands from a host. The method includes executing the write commands to generate an updated data file and generating a record of the write commands. The system and method further include a secondary volume having a copy of the data file stored thereon. The secondary volume is configured to receive and store data indicated by the write command record.

Hostetter does not disclose a first storage system having "a first storage area" for storing write data received from a host and "a second storage area" for storing the write data and update information associated with the write data. Hostetter also does not disclose a third storage area in a second storage system that stores the write data and update information received from the second storage area.

U.S. Patent App. Pub. No. 2003/0074600 to Tamatsu

Tamatsu discloses a data backup and recovery system that enables backup and recovery of data at low cost and in short periods of time. The system is comprised of a primary system that updates the source data and one or more secondary systems that back up the source data. The secondary systems may be installed in the vicinity of the primary system or at a remote location. The secondary systems have the same logical configuration as the primary system and perform backups by acquiring the most recent data in real time. The update histories maintained by the secondary systems may be used to restore the primary system to any given state at an earlier point in time. Using a secondary system as a referential tool enables load

distribution; the backup processing of the secondary system may then be suspended to perform referential batch processing while it is detached from on-line processing.

Tamatsu does not disclose a first storage system having "a first storage area" for storing write data received from a host and "a second storage area" for storing the write data and update information associated with the write data. The reference also does not disclose a third storage area in a second storage system that stores the write data and update information received from the second storage area.

In addition to the differences illustrated between the above references and the embodiments as claimed in claim 1, the above references also do not disclose the features recited in other independent claims 17, 29, and 40. This would be apparent when the recited features of these claims are examined in view of the discussions above. Certain dependent claims also recite features that are not disclosed by the references, e.g., the feature of claims 2 relating to the second storage with a plurality of storage regions and the feature of claim 8 relating to the second storage system defining the access intervals.

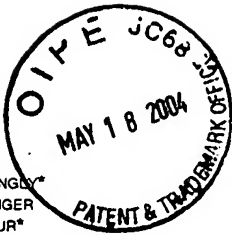
In view of this petition, the Examiner is respectfully requested to issue a first Office Action at an early date.

Respectfully submitted,



Steve Y. Cho  
Reg. No. 44,612

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PATENT, TRADEMARK  
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February 5, 2004

Re: Search for Petition to Make Special  
U.S. Appl. No.10/650338  
Your: 340300933US01  
Our: HIT 0401-010

Junichi Kishida, Manager  
Patent Department 2  
Hitachi, Ltd. Intellectual Property Department  
292, Yoshida-cho, Totsuka-ku, Yokohama-shi  
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Dear Mr. Kishida:

Please find attached our search report for the above-reference U.S. application. We have included a CD-ROM disk containing copies of our findings in Adobe PDF form.

Since this is one of our first reports for this type of search, we would be happy to receive any comments regarding the format of the report and the usefulness of our comments. If you prefer to see changes made to future search reports, please let us know.

Should you have any questions, please contact us.

Best regards,

David W. Tucker

**U.S. Application 10/650338 Patentability Search Report**

**Confidential**

**Subject of our Search**

Our search was conducted to find prior art for Claims 1-39 of U.S. Application 10/650338. The claims concern data replication between a plurality of storage systems. As a representative example (e.g. Claim 1), a first storage system is connected to a host for sending data to and receiving data from the host. A second storage system is connected to the first storage system for receiving data from the first storage system. The first storage system comprises a first storage area for writing data sent from the host, and a second storage area for writing the data written in the first storage area and update information relating to said data (i.e. journal). The second storage device comprises a third storage area for storing the data read from said second storage area (the data and update data). The data and update information stored in the third storage area are read from said first storage system at prescribed time intervals. The phrase "at prescribed time intervals" is an important aspect to all the independent claims. In another embodiment (e.g. Claim 29), three storage systems are included in a cascading connection. Data and update information stored in the third storage system is read from the second storage system at prescribed intervals.

**Field of Search**

<u>Class</u>	<u>Subclasses</u>
714	6, 11, 13, 19
711	113, 114, 162, 164
710	21
707	8, 10, 201, 202, 203, 204, 205, 206

Our search included broad keyword searches of the U.S. Patents and U.S. Patent Publications databases.

**Results of our Search**

U.S. Patents

5,974,563	Beeler
6,178,427	Parker
6,282,610	Bergsten
6,308,283	Galipeau
6,393,538	Murayama
6,397,307	Ohran
6,408,370	Yamamoto

6,442,706	Wahl
6,460,055	Midgeley
6,487,645	Clark
6,526,487	Ohran

U.S. Patent Application Publications

2003/0074378	Midgley
2003/0014433	Teloh
2003/0014432	Teloh
2002/0133511	Hostetter
2003/0074600	Tamatsu

**Discussion**

Patent application publication **2003/0074378 (Midgley)** discloses a first storage system having a database store and a separately stored journal. The system monitors changes to the journal and sends a copy of the journal to a second storage system (remote server) if changes are detected (see paragraphs 0012 and 0064). The second storage system then makes changes to its local store based on the received journal. The subject "prescribed time intervals" is not disclosed. See also **Patent 6,460,055 (Midgley)**.

Patent application publications **2003/0014433 (Teloh)** and **2003/0014432 (Teloh)** disclose a first storage system having a data store and also a log store of changes made to the data store. The first storage system sends the log to a second storage system asynchronously. A third storage system can be provided that receives the log from the second storage system. In '433, note Figure 9 and paragraphs 0019, 0025 and 0043+.

Patent application publication **2002/0133511 (Hostetter)** discloses a primary storage system connected to a host system. The primary system is further connected to a secondary storage system. The primary storage system has a data store and a separate store of write commands (log). The write commands log is sent to the secondary system and stored there for use by the secondary system to make changes to its local data store.

Patent application publication **2003/0074600 (Tamatsu)** discloses a first storage system (primary) connected to a second storage system (secondary) by communications means 3. Log data stored at the primary system is sent to the secondary system and is used to conduct updates there. See paragraphs 0119+.

Patent **6,526,487 (Ohran)** discloses a first storage system that sends a copy of its received write requests to a secondary store for use in making changes to its local store.

Patent **6,487,645 (Clark)** discloses a host that sends update requests to a first storage system (primary storage subsystem). The updates are stored in a log at the first system which



later sends the update log to a second storage system (secondary subsystem) for making changes to its local store.

Patent **6,442,706 (Wahl)** discloses a first storage system (primary) having a local data store and a separate journal store (writelog). The first storage system sends the writelog data to a remote second storage system (secondary) which in turn commits the data updates to its local mirror data store (see column 3, lines 14+).

Patent **6,408,370 (Yamamoto)** discloses a first storage system having a primary store and a local store of write requests. The first storage system sends both the write data records and the write requests to a second storage system for use by its system to make changes to its local data store.

Patent **6397307 (Ohran)** discloses a first storage system (primary mass storage) with a local store which caches changes sent from a host. The changes are consolidated into an update file and the update file is periodically sent to a secondary storage system where the update file is used to make changes to its local store.

Patent **6,393,538 (Murayama)** discloses updates sent from a host to a first primary storage system. The primary system sends the updates to a secondary storage system.

Patent **6,308,283 (Galipeau)** discloses a first storage system (local computer system) with a data store and a change log store. The first system sends the log to a remote second storage system where changes are made to its local store.

Patent **6,178,427 (Parker)** discloses a remote secondary storage system that receives log data from a primary storage system and makes changes to its local store based on the log data.

Patent **5,974,563 (Beeler)** discloses a first storage server (primary) that receives change requests from hosts, and these changes requests can be stored at the primary server in a special file queue directory. The changes requests are later communicated to a secondary server.

Patent **6,282,610 (Bersten)** discloses cascaded storage controllers, each controller connected to a host and a local store. When changes are made to a local store, its controller sends the change requests to the next controller where changes are replicated. The changes sent from a first storage system to a second storage system are cached at the second system.